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Social Sciences and Humanities Research Council of Canada

Conseil de recherches en sciences humaines du Canada

ABOUT NERVE CENTRES.

By Phusis.

It is of the greatest importance to remember that in the child all the functions of the body are very quickly exhausted. Being as yet in an undeveloped condition they are unable to sustain any prolonged effort. Too often forgotten in connection with digestion, this fact is even more important in regard to the amount of strain that may be put upon the young nerve centres, within the bounds of healthy growth and development.

In view of certain facts as to the brain which I wish to bring forward, I believe there is a very real danger at the present time of over-pressure. Without discussing this subject, which has been gone fully into by a Royal Commission, I desire to bring together certain thoughts which may not have been before suggested in this Review.

It is only right that parents should be warned against the harm that may result from over work in general, and from evening work in particular. Certainly many would do well to ponder this matter before they allow their boys to be forced on at the rate that some are, in order that they may obtain the questionable advantage attaching to prizes and scholarships.

Life has been divided into organic and animal. Organic life applies to functions which are absolutely essential to existence; animal life includes the power to feel, to move, and to communicate with the outer world. The organic processes of absorption and assimilation obtain in plants as well as animals; but in animals we get brain, organs of sense and voluntary powers, all of which attain their highest development in the human subject.

The nerve centres in the brain are placed, and indeed develop, in a certain definite order, exactly to suit the organism they have to serve, and the parts which attain to the highest development in the adult are the last to come to perfection. Let us be most careful, therefore, in dealing with the young, not to deviate from the paths which Nature has here indicated to us.

For every movement of our body of any complexity, afferent impulses are as essential as the executive efferent impulses; that is to say, it is the afferent impulse or message *to* the brain (through the sensory nerves of the skin), that gives rise to the efferent impulse or command *from* the brain, which enables the horse to switch the fly from its back with its tail. There is a constant stream of these afferent impulses ever passing in by the various "entrance gateways," such as the eye, the ear, and the sense of touch possessed by the skin, to the brain. Afferent impulses give rise to one or more definite efferent impulses and these again result in appropriate movements. We should expect, therefore, to be always moving, always on the go. But in order to prevent this as far as possible, we are endowed with a certain controlling influence, which enables us to disregard many of these impulses, and to concentrate our attention upon some particular act we may wish to perform. It is through the inhibitory power of our cerebral and spinal centres that we keep in check the rush of afferent impulses, so that our movements may be definite and purposive, without any unnecessary expenditure of energy. Such are some of the powers of full mental development.

It is far otherwise in the idiot, whose mental faculties are either deficient, or have failed to undergo development. His movements are for the most part purposeless and without any definite aim.

Now, in the child, the nerve centres have not yet acquired that inhibitory power of which I have spoken. Hence, what is to the adult a simple matter, may, in the child, be a very great effort indeed. Untrodden are the psychomotor paths, the virgin centres know not their nervous stimuli. The channels along which nerve impulse has to travel are but ill defined; we thus have, in the brain, a flood of impulses, causing considerable activity in centres over a wide area, owing to the intensity of the "diffusion" process, as it has been termed. Witness the child learning to write. The effort is tremendous. Entrance and exit gateways seem all thrown open at once, so that eyes, tongue, lips, legs, and arms,—the centres for which are all called into play by diffusion,—are all going together; hence the remarkable attitudes and gestures, and apparently useless movements. These superfluous movements in the young child are characteristic. As development proceeds, diffusion becomes less and less, until finally the most complicated action may become almost automatic, and comparatively unattended by effort. We thus see that there is a very definite connection between the afferent impulse on the one hand, and movement, which is the result of the mental process, on the other. How important, therefore, to both parents and teachers, is the study of Physiology, by which they may make themselves familiar with the entrance and exit gateways to the brain, and the various means by which they may encourage the good and restrain the evil.

That which in small doses acts as a stimulant, may in large doses become a depressant. Our stimulation of the nerve centres must be gentle if we would secure a careful mental training in our little ones. If education be pushed to its extreme limits we shall easily overstep the bounds of health, and in a very short time entirely annihilate any progress that may have been made, and not without some damage to the centres involved. As in nutrition, so in education, we must err on the side of starvation. But Physiological facts will do far more than any amount of dogmatic statements, to convince parents and teachers of the dangers of overwork, and it is this thought that has led me to put forward the following, as having an important bearing on the subject matter in hand.

Rest is an agent which enters very largely into the life history of the child; in fact, the greater part of existence at this time is spent in sleep. And here, I may point out, it is not mere repose from action that is required to restore the nervous energy. There must be, as MacNish has it in his "Philosophy of Sleep," complete oblivion of feeling and imagination. In sleep there is diminished vascular action, and the brain is relatively anæmic, or less abundantly

supplied with blood. All except the vital nerve centres, *e.g.*, those of the heart and lungs, are in abeyance, and in this state we may be said to be under the influence of organic life alone. The first to disappear in sleep is the conscious controlling power of the mind; then reflex cerebration, followed by the voluntary centres, and lastly, the ordinary reflexes, the vital centres never ceasing their endless toil until the final sleep of death. The physical phenomena of sleep, if taken in their reverse order, give us, I think, an insight into the development of the nervous system, and in the few minutes occupied by the waking state, we get a glimpse of a process that is spread over many years.

The state of the brain during active mental exercise is in many respects the very opposite to that which obtains in sleep. Thus, during normal intellectual effort, the brain is hyperæmic, or more abundantly supplied with blood. If, then, we represent the blood supply to the brain as one, the circulation during sleep will be minus, and during active mental work plus. Again, we find during mental effort that though the pulse at the wrist is unaltered, yet the large vessels in the neck show a marked change, indicative of dilatation of the vessels over a fairly extensive area of the brain. There is at the same time a distinct rise of temperature over the first and second frontal convolutions.

Lastly, what is known as "re-action time," or the time taken by a mental process to respond to a stimulus, is lengthened by fatigue of the cortical centres in a comparatively short time.

As regards the circulation alone, therefore, we have to do with three distinct conditions, viz., the brain at rest, the brain during sleep, and the brain during active mental effort. Whereas sleep is essential to good intellectual work the latter, if carried too far and indulged in at a wrong time, is absolutely derogatory to sleep. How pernicious, then, to the health of the child must be the practice of doing evening lessons. By such lessons we render the state of the brain the very reverse of that which is necessary to sound repose.

I look upon evening preparation for children as the worst form of overwork. All disturbances of the brain are greatly exaggerated in children. If, then, in the normal mental process there is hyperæmia, which is only a degree short of congestion, there is little wonder that overwork deranges the nerve centres, and that evening work, by preventing sleep, must be absolutely harmful to the child. I dwell upon this point because it helps to explain such conditions as talking in the sleep, twitchings, restlessness and headache, so frequently seen in children at the present time. It will also account for the so-called neurotic conditions, more especially in those who as infants were brought up on artificial food.

Surely, as each of the entrance gateways to the brain is thrown open we should show the child the proper exit gateway. We must act the part of the inhibitory powers until such time as the controlling centres in the child's brain are able to act for themselves. How seldom is this done in actual practice. The whole aim seems to be to urge on, rather than restrain, the flow of impulses to the brain. By so doing we embarrass when we ought to help the only too willing but fragile nervous mechanisms. We cannot prevent diffusion which results in superfluous movements, but we can turn these to account if we only take the trouble, for we can so guide and direct them that what were at one time useless, shall be most valuable aids to development.

This is one of the strongest points in favour of hand and eye training, that what I have called superfluous movements in children are pressed into the educational method, and in this way the child learns to turn to the best advantage what would otherwise have been a useless expenditure of energy.

THE TEACHING OF NEEDLEWORK.

We usually hear Needlework spoken of as an art, but it is, I think, making too high a claim for needlework to place it among the arts. That it held a modest place among them some centuries ago is undoubtedly the case, and that it is capable of artistic treatment at the present day is also undeniable; but its utilitarian side has developed so greatly, and its artistic side has suffered such degradation, that I think we should rather regard it as an art of a past age than as entitled to claim a place among those arts which are active influences to-day.

In saying this I have no desire to speak slightingly of needlework, or to detract in any way from the honourable position which it holds in the estimation of all right-minded people. On the contrary, I consider needlework, rightly regarded, as an instrument of training which may be made of immense service in the education of children. But I think the opportunity it affords is too often wasted, because it is taught in a conventional way, which may result in the acquirement by the pupil of the power of making microscopic stitches at the expense of her eyes, her time, and her temper, but which may have no other result, except that of giving the child a hatred and disgust of needlework for the rest of her life.

In the teaching which aims only at a mechanical perfection of this kind there is no value, and a pursuit which might be made of educational service is rendered tedious to both teacher and taught, and no one is any the better for it. Nothing is achieved beyond a few hundred little dots of more or less dirty cotton, which represent the labour of weeks, and which could have been better done by a second-rate sewing-machine in ten minutes.